DOCUMENT RESUME

ED 137 067 SE 021 909

AUTHOR Greening, Gary A.
TITLE A Science Assessment Program for Kindergarten and First Grade Students.
PUB DATE [76]
NOTE 50p.; A 1976 Ohaus-NSTA Award winning paper; Not available in hard copy due to marginal legibility of original document

EDRS PRICE MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS Cognitive Measurement; Elementary Education; *Elementary School Science; *Evaluation; *Instructional Materials; Kindergarten; Kindergarten Children; *Learning; Science Education; *Science Units

ABSTRACT

Presented are science units for kindergarten and first-grade classes which include one or more non-verbal test items constructed to determine whether the student has learned the material presented in the unit. Units include: light, senses, gerbils, beans and peas, animal activities, and hatching chicks. (SL)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED137067

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

A SCIENCE ASSESSMENT PROGRAM

FOR

KINDERGARTEN

AND

FIRST GRADE STUDENTS

Gary A. Greening
Bloomington Public Schools
Bloomington, Minnesota

SE 021 909

Acknowledgements

I would like to thank the kindergarten teachers, Mrs. Nancy Tilbury and Mrs. Doris Stenberg, and the first grade teachers, Mrs. Wendy Shearer and Mrs. Priscilla Sondergaard, who spent many hours helping me and collecting the items used in the various pictures.

ABSTRACT

Measurement of learning in science education has always been an elusive goal which all science teachers who have a desire for effective teaching are always attempting to reach.

The program described in the following paper is an attempt to reach this goal. The primary effort of this program is to measure the degree of learning in science for kindergarten and first grade students in such a way that no reading ability is needed. Further, the material is designed so that the classroom teacher can administer and interpret the results so that teaching techniques can be adjusted to improve instruction and learning.

Sample objectives, description of corresponding test items, sample test items, sample answer sheets, and preliminary test results are included after the description of the program is given.

TABLE OF CONTENTS

Acknowledgements	i
Abstract	ii
Table of Contents	iii
Introduction	1
Content	3
Numbering and Coding	4
Test Items	5
Test Results	8
Conclusion	8
References	9
Appendices	10

I. Introduction:

Learning, at its best, is difficult for many students, especially students with little if any, reading ability. Evaluating the amount of learning for students with some reading ability is also difficult at best, but measurement of learning for the non-reading student is particularly difficult since few if any evaluative tools have been developed in this area that can be used by the classroom teacher.

The concern for the need of such an evaluative tool especially for elementary science, is what prompted the development of the project which is described in this paper. The underlying premise for this project has been aptly stated by Blackwood and Porter 1 :

> We know enough about learning to say with confidence that children engaged in formal or informal, systematic or unsystematic, planned or unplanned approaches to a study of the world around them will learn something. Each child will learn to a degree related to his involvement in the process and his capacity at any time. The challenge of science teaching in school is to assist children in every way possible to learn more of what is interesting and hopefully significant, in science.
>
> Is science being taught in your school? If the answer is YES, then it is fair to move to the next question: How well are the children doing? A premise that cannot be avoided and one that teachers must hold ever present is that children tend to learn those things they have an opportunity to learn and they do not learn those things they have no opportunity to learn.
>
> If teachers accept this premise wholeheartedly and believe that their school has an excellent program in science, they should have some way to evaluate their teaching of science.

For too long now science achievement in elementary schools has been assumed, but no real effort has been made to measure the degree or amount of learning. Victors' point made in relation to the many elementary science curriculum projects is relevent here (2). He points out that provision must be made for

adequate evaluation. Too much emphasis is given to teacher testimonials and pupil enthusiasm and too little to develop other evaluative means.

Learning has been assumed even though objectives were vaguely stated and evaluative techniques, where they existed, were equally as vague or were attempted using a paper and pencil technique that required at least some proficiency in reading and writing.

A major function of a classroom test is to measure student achievement, and thus contribute to an evaluation of educational progress. Tests that measure only verbal memory fail this function. What the teacher needs is evidence of a student's understanding - of his command of the idea as a tool in thinking - and not the recall of the conventional verbal expression of the concept or principle. Reasoning, critical thinking, and the ability to see relationships are the attributes of the learning process that must be selected as standards of achievement against which student performance should be evaluated if we are to provide actual, understandable, and meaningful data to those demanding accountability from schools.

The instructional research literature indicates that questions are usually directed toward the verbal medium, with little or no concern for the potential role of the pictorial medium. However, examination of science textbooks reveals a heavy reliance upon the picture to help communicate information to the learners (3). With this as a premise, why has there not been a concerted attempt to test students in the same way? An attempt, such as the one made by Podrasky (4), would at least display an awareness of the value of the use of pictures as a testing medium.

At another level of learning, a recent study of the science students at Jefferson High School in Bloomington, Minnesota, indicated that most of the students' verbal I.Q. is lower than their non-verbal I.Q. Yet even at this level there seems to be an insistence that the student be evaluated with verbal techniques which is for many students their weakest learning mode.

With these feelings and attitudes in mind the material presented here was prepared in an attempt to provide an evaluative technique which meets the following criteria:

1. Clearly stated criterion referenced objectives with test questions constructed to fit the objective.
2. Test questions constructed in such a way that no reading knowledge would be needed by the student.
3. Test questions designed in such a way that a classroom teacher could administer the test and interpret the results.

II Content

The project being presented here is concerned only with the science units which are taught during kindergarten and first grade in the Bloomington Public Schools.

For Kindergarten the units taught are:

Unit I: Watching and Wondering

Unit II: Getting Ready Activities

Unit III: Lights and Shadows

Unit IV: Using our Senses

Unit V: The Curious Gerbils

Unit VI: The Life of Beans and Peas

For First Grade the units taught are:

Unit I: Changes

Unit II: Growing Seeds

Unit III: Animal Activities

Unit IV: Material Objects

Unit V: Hatching Chicks

Unit VI: Organisms

Each unit has been divided into various numbers of objectives, ranging from four in Unit I to eight in Unit II for Kindergarten, and each objective has had one or more non-verbal test items constructed that attempts to determine whether the student has learned the material set forth in the objective. (See Appendix 3 and 4)

III Numbering and Coding

For purposes of record keeping and specific identification of areas where learning has or has not taken place the objectives and corresponding test items have been assigned a number.

Numbering in this manner proved to be of great value when test results indicated something was wrong in one or more areas of the unit. When indications of difficulty on a test item showed up it was possible to analyze the test item, rewrite the objective or examine the method used to teach that topic. This it is hoped will eventually result in a higher quality science program for the students.

The same system of numbering was used for both kindergarten and first grade in an attempt to provide some consistency. It should be pointed out that the numbering and coding of questions was done primarily so the teachers and examiners could keep more accurate records, but the students did not use the numbering to keep track of the questions and answers. Students kept track of questions

by another method which will be explained later.

As an example, the fourth objective in Unit II for Kindergarten would be numbered in the following way; K - II - 04, where:

K - indicates the objective written for kindergarten

II - indicates the objective is written for the second unit of the kindergarten program

04 - indicates the 4th objective written for the second unit of the kindergarten program

The corresponding test items, for which there is more than one in most cases, would have the number K-04-a which can be explained as follows:

K - indicates the test item is for kindergarten

04 - indicates which objective the test item is written for

a - indicates that the test item is the first test item for that objective. Further questions would merely have to be b, c, d, etc.

The number indicating the unit was omitted from the test item because the teachers working on the project felt that the coding system should not get too complicated. Thus a different colored background for the picture of different units was used to keep track of the units. The colors used for each unit are: Unit I - yellow, Unit II - Green, Unit III - Orange, Unit IV - Tan, Unit V - Red, and Unit VI - Pink.

IV Test Items

The test items in this program are a series of 2 x 2 slide pictures which are projected on a screen during testing. Each test item consists of two slides; a stimulus slide and a response slide. (See appendix 5 and 6 for examples)

The stimulus slide, which is shown first, consists of a single picture which indicates a given condition to the student that he is to consider. The response slide, which is then shown beside the stimulus slide, consists of four pictures, one of which is related to the stimulus slide. To answer the question the student chooses the one picture out of the four on the response slide that is related to the condition given pictorally by the stimulus slide and/or verbally stated by the examiner.

The test items are not numbered for the students since it was felt that especially for kindergarten students this would be too difficult for them to handle. Instead, both the stimulus and response slide, has a smal familiar figure in the lower left hand corner which also appears on the answer sheet so the student will know where to indicate his response to the question.

For the kindergarten program, each picture in the response slide also has a figure design which is used in all the test items so that the student might better be able to identify the choice he or she wants to make. The figures are , , and .

Then, if the picture the student feels is the correct answer contains the the student merely makes an X in the box on the answer sheet that contains a for the appropriate question. See appendix 7 for a sample answer booklet for kindergarten.

The use of figures to indicate different answers was not used for the first grade students since it was felt they would be able to transfer their choice on the screen to their choice on the answer sheet without the added references. See appendix 8 for a sample answer sheet for first grade.

For example, if an attempt were being made to see if a kindergarten student could recognize a geometric shape in a red object, the test item would be the one given below.

Stimulus Slide

Response Slide

The stimulus slide would be projected first and then the response slide. would be projected so that both slides would be on the screen at the same time. This allows the students to make visual comparisons, and then the student is asked to pick the object in the response slide that has the same shape as the object in the stimulus slide.

The student would then refer to the "monkey" question and mark the box containing the to indicate the correct answer if that were the student's choice.

V. Test Results

The program has not been in existence long enough for extensive testing, so no attempt has been made to standardize the units or to determine reliability and validity. Once the program has been used more extensively, however, these parameters can be determined with some degree of accuracy.

As a matter of preliminary testing and to give those working in the program some idea of how the program would work, one test was administered to a kindergarten class and to a first grade class. I administered the kindergarten test, and a teacher who did not work on the program administered the test to the first grade class.

The preliminary statistical results for kindergarten can be found in appendix 1 and for first grade the results can be found in appendix 2.

Looking only at difficulty, it can be seen that the test for kindergarten seemed easier (.80) than the first grade test (.61), but the larger number of students tested and the fact that the test was administered by someone not working on this program could be a possible explanation for the difference.

It is interesting to note that none of the distractors for the first grade test were completely ignored, while all of the questions in the kindergarten test, except number 8, had at least one distractor which was not picked by anyone.

Each test had one perfect score, and each test had one question that seemed significantly more difficult than the others (question 8 for kindergarten and question 9 for first grade) with the final results showing the potential for accurate evaluation which was desired at the onset of the program.

VI. Conclusion

All early indications would indicate that the program has a great deal of potential, especially if time is spent carefully analyzing and evaluating each question and each objective for each unit.

Both teachers, students and administrators who have used the program, been tested, or have been asked to offer their opinions have been very enthusiastic about the program.

Teachers have found it to be a very useful teaching aid instead of a testing medium. Students don't seem to feel threatened, find it easy to follow the testing procedure after a few examples, and maintain a high attention level because of the changing colored slides.

The ultimate goal in a program such as this is to apply it to all grade levels K-12, and if it can be effectively applied to kindergarten and first grade then it would only be a matter of time and effort until all students could be tested without a dependency on reading.

References Used

1. Blackwood, P.E. and Porter, T.R., "How to Evaluate Science Learning in the Elementary School," Instructional Aid by National Science Teachers Association, Stock No. 471-14564, 1972

2. Victor, Edward, "Controversial Aspects of the Elementary Science Curriculum Projects," Science and Children, Volume 5, No. 2, October 1967, pp. 27-31.

3. Purpose statement for a symposium entitled, Pictorial Communication Research in Science Education at the annual meeting of the National Association for Research in Science Teaching, Detroit, Michigan, March 27-29, 1973.

4. Podrasky, Edward F., "Nonverbal Assessment of Learning", The Science Teacher, Volume 38, Number 6, September 1971, pp. 39-41.

Appendix 1

Kindergarten

Unit I - Senses

Preliminary Statistical Testing Results

KINDERGARTEN

Unit IV - Senses

Preliminary Test Results

Statistical Data Summary	
Number of Students Tested	59
Mean	16.07
Q1, the 25th Percentile	15.84
Q2, the 50th Percentile	16.81
Q3, the 75th Percentile	17.30
Variance	6.96
Difficulty Level	.80
Lowest Score	7
Highest Score	20

Frequency Distribution

Score	Frequency	Plot of Frequency Distribution
20	1	x
19	2	xx
18	6	xxxxxx
17	30	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
16	8	xxxxxxxx
15	4	xxxx
14	22	xx
13	2	xx
12	0	
11	0	
10	0	
9	0	
8	2	xx
7	2	xx

KINDERGARTEN

Unit IV - Senses

Preliminary Test Results

Difficulty of Each Item on Test

Item Number	Number who Answered correctly	Choices for Each Item				Correct Choice for Item	Difficulty of Item
		A	B	C	D		
1	53	0	53	6	0	B	.89
2	53	0	53	0	6	B	.89
3	53	4	0	2	53	D	.89
4	55	0	2	55	2	C	.93
5	55	2	55	2	0	B	.93
6	55	0	0	4	55	D	.93
7	51	51	8	0	0	A	.86
8	7	18	22	7	12	C	.11
9	57	0	2	0	57	D	.96
10	57	57	2	0	0	A	.96
11	15	15	8	30	6	A	.25
12	57	0	2	57	0	C	.96
13	49	2	49	6	0	B	.83
14	53	0	2	53	4	C	.89
15	57	0	57	2	0	B	.96
16	49	49	6	4	0	A	.83
17	35	35	14	4	6	A	.59
18	31	10	2	31	16	C	.52
19	53	0	2	4	53	D	.89
20	53	2	0	4	53	D	.89

Appendix 2

First Grade

Unit II - Growing Seeds

Preliminary Statistical Testing Results

FIRST GRADE

Unit II - Growing Seeds

Preliminary Test Results

Statistical Data Summary	
Number of Students	102
Mean	9.22
Q1, the 25th Percentile	7.65
Q2, the 50th Percentile	9.50
Q3, the 75th Percentile	11.58
Variance	7.95
Difficulty Level	.61
Lowest Score	2
Highest Score	15

Frequency Distribution

Score	Frequency	Plot of Frequency Distribution
15	1	x
14	2	xx
13	6	xxxxxx
12	18	xxxxxxxxxxxxxxxxxx
11	6	xxxxxx
10	18	xxxxxxxxxxxxxxxxxx
9	17	xxxxxxxxxxxxxxxxx
8	10	xxxxxxxxxx
7	8	xxxxxxxx
6	4	xxxx
5	2	xx
4	6	xxxxxx
3	2	xx
2	2	xx

FIRST GRADE

Unit II - Growing Seeds

Preliminary Test Results

Difficulty of Each Item on Test

Item Number	Number who answered correctly	Choices for Each Item				Correct Choice for Item	Difficulty of Item
		A	B	C	D		
1	86	6	4	6	86	D	.84
2	57	11	21	13	57	D	.55
3	41	41	11	12	38	A	.40
4	43	43	22	12	25	A	.42
5	82	2	10	82	8	C	.80
6	85	85	11	2	4	A	.83
7	62	19	6	15	62	D	.60
8	60	60	22	4	16	A	.58
9	21	8	21	57	16	B	.20
10	66	66	18	10	8	A	.64
11	44	40	6	12	44	D	.43
12	72	8	72	12	10	B	.70
13	80	15	2	5	80	D	.78
14	65	11	7	65	19	C	.63
15	76	76	14	4	8	A	.74

Appendix 3

Kindergarten

Performance Objectives

and

Test Items

Unit IV

USING OUR SENSES

K-IV-01: Given a picture of a part of the body that uses one of the senses (i.e. eyes - sight, ear - hearing, etc.), the student will indicate his ability to describe an object using one of the senses by picking one picture out of four that would require the use of the sense given to identify.

Test Number and Symbol	Stimulus Slide	Characteristic being tested	Response Slide
K-01-a Frog	Picture of an eye	What can't you see?	Balloon / All black section Bicycle / Bananas
K-01-b Boot	Picture of an ear	What can be heard?	Sun / Horn player Rainbow / Flower
K-01-c Pencil	Picture of a nose	What can you smell?	Pencil / Rainbow Table / Flower
K-01-d Cup	Picture of a mouth	What can you taste?	Sun / Rainbow Ice cream cone / Flower
K-01-e Xylophone	Picture of a hand	What can you feel?	Rainbow / Bunny Sun / Cloud

K-IV-02: Given a sound that is familiar to the student, the student will be able to identify an object by the sound it produces, by picking one picture out of four that shows an object which is commonly associated with that sound.

Note to the teacher: For this objective there is no stimulus slide, but rather a short piece of recorded tape for each question.

Test Number and Symbol	Stimulus Tape	Characteristic being tested	Response Slide
K-02-a Nut	Sound of telephone	Object which makes sound	Piano / Typewriter Fire engle / Telephone

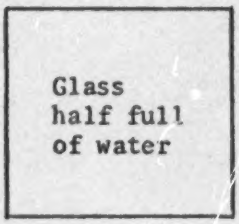
K-IV-03: Given a sound produced by vibrations (i.e. drum, guitar, etc.), the student will show his ability to associate a sound with a particular instrument by picking one picture out of four that shows the object that produces the sound given.

Note to the teacher: For this objective there is no stimulus slide, but rather a short piece of recorded tape for each question.

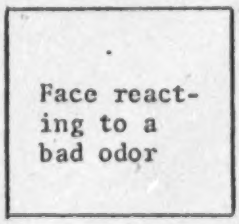
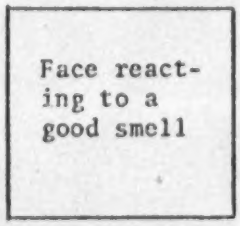
Test Number and Symbol	Stimulus Tape	Characteristic being tested	Response Slide
K-03-a Sun	Sound of man singing and playing guitar	Instrument producing sound	Boy playing guitar / Guitar People playing drum / Drum

K-IV-04: Given a picture of a glass half full of water that is colored and a tape correlating the sound of the original glass of water half full and four other glasses contain water, the student will show his ability to determine pitch by picking the picture that gives the same pitch as the original glass of water.

Note to the teacher: For this objective the sound of a glass that is half full of water being struck, is played as a picture of a glass half full of water as shown, as a stimulus slide.

Test Number and Symbol	Stimulus Slide and Tape	Characteristic being tested	Response Slide
K-04-a Zipper	 Glass half full of water Sound of glass being struck	Which glass would give the same sound?	full glass / half full glass 1/4 full glass / 1/8 full glass

K-IV-05: Given a picture of a child experiencing a bad or a good odor, the student will illustrate his ability to describe objects by their odor by picking one picture of an object out of four that would give the student the same or a similar reaction as originally pictured.

Test Number and Symbol	Stimulus Slide	Characteristic being tested	Response Slide
K-05-a Key	 Face reacting to a bad odor	What makes a bad odor?	Flower / Ice cream cone Apple / Skunk
K-05-b Santa Claus	 Face reacting to a good smell	What makes a good smell?	Flower / Table Garbage can / Skunk

K-IV-06: Given a picture of an object that represents the basic tastes of sweet, sour, salty or bitter, the student will illustrate his ability to determine the basic tastes by picking one picture out of four that represents the same taste as the given object represents.

Test Number and Symbol	Stimulus Slide	Characteristic being tested	Response Slide
K-06-a Ice cream bar	Candy bar	Which object also tastes sweet?	Cup-cake / Pretzel Lemon / Toast
K-06-b Doll	Pickle	Which object also tastes sour?	Cup-cake / Pretzel Lemon / Toast
K-06-c Tire	Potato chips	Which object also tastes salty?	Cup-cake / Pretzel Lemon / Toast

K-IV-07: Given a picture representing a touch sensation the student is familiar with (i.e. cold, wet, hot, etc.), the student will display his knowledge of touch relationships by picking one picture out of four that would give the same sensation to touch as the original.

Test Number and Symbol	Stimulus Slide	Characteristic being tested	Response Slide
K-07-a Yarn	Table top	Which object is also smooth?	Brick / Gravel Book / Burlap

Test Number and Symbol	Stimulus Slide	Characteristic being tested	Response Slide
K-07-b Elephant	Brick	Which object is also rough?	Block of Wood / Gravel Book / Fur
K-07-c House	Fur	Which object is also furry?	Furry muff / Grass Hair / Burlap
K-07-d Tree	Block	Which object is also hard?	Ice cream bar / Marsh-mellow Glass / Rubber ball
K-07-e Sled	Fire	Which object is also hot?	Ice cube / Stove burner Burner not lit / Unlit campfire
K-07-f Heart	Ice cubes	Which object is also cold?	Snowman / Swimming pool Glass of milk / Cup of steaming coffee
K-07-g Undershirt	Waterfall	Which object is also wet?	Towel / Faucet not running Faucet running / Umbrella

Appendix 4

First Grade

PERFORMANCE OBJECTIVES

and

Test Items

Unit II

Growing Seeds

I-II-01: Given a picture of a real seed, the student will demonstrate his ability to identify at least two parts of the seeds by selecting one picture of a seed out of four that correctly indicates two possible parts.

Test Number and Symbol	Stimulus Slide	Topic being Tested	Response Slide
I-01-a Alligator	Bean Seed	Parts of a seed	Open bean One part missing | Open bean, One part missing Open bean All parts missing | Open bean, All parts showing

I-II-02: Given a picture of a seed, the student will indicate his ability to devise a method of grouping seeds with similar characteristics by selecting one picture out of four that has seeds grouped according to the original characteristic given in the picture of the single seed.

Test Number and Symbol	Stimulus Slide	Topic being Tested	Response Slide
I-02-a Axe	Peach Seeds	Group according to bumpy surface	poppy seeds | pea seeds bean seeds | marigold seeds
I-02-b Banana	Bean Seeds	Group according to color	red seed | dark green brown seeds | light green
I-02-c Car	Small seeds	Group according to size	small seeds | large seeds medium seeds | very small seeds

I-II-02 (cont.)

Test Number and Symbol	Stimulus Slide	Topic being Tested	Response Slide
I-02-d Dog	Bean Seed	Group According to Shape	circular / oval same shape / long

I-II-03: Given a picture of a planted seed at some stage of development, the student will illustrate his ability to identify the next expected change in the planted seed by selecting one picture out of four that represents the next expected change.

Test Number and Symbol	Stimulus Slide	Topic being Tested	Response Slide
I-03-a Elephant	Sprouting Seed	What is next stage of development?	Bud Forming / Flower Dropping Flower in full bloom / Flower starting to bloom
I-03-b Fish	Flower starting to bud	What is next stage of development?	Sprouting / Flower Dropping Flower Full Bloom / Flower Starting to Bloom

I-II-04: Given a picture of a seed, the student will indicate his knowledge of how that seed differs after it has been planted by selecting one picture that represents a possible product of the plants growth from three others that are not possible products.

Test Number and Symbol	Stimulus Slide	Topic being Tested	Response Slide
I-04-a Jeep	Apple Seed	Possible Products of seed Growth	Apple / Rabbit Car / Hatch Chicks
I-04-b Ladybug	Corn Seed	Possible Products of seed Growth	Bath Tub / Ear of Corn Chair / Dog

I-II-05: Given a picture of a bean, pea, radish or beet being planted, the student will demonstrate his knowledge of which seed will sprout first and develop fastest by selecting the picture of that seed from a group of pictures including the seeds given above.

Test Number and Symbol	Stimulus Slide	Topic being Tested	Response Slide
I-05-a Leaf	Child Planting Seeds	Which seed will sprout first?	pea / bean beet / radish

I-II-06: Given a picture of a planted seed, the student will illustrate his knowledge of the sequence of events from germination to full growth by selecting one picture representing the correct sequence from three other pictures depicting incorrect sequences.

Test Number and Symbol	Stimulus Slide	Topic being Tested	Response Slide
I-06-a Lion	Seeds Planted In Pot	What is the correct sequence of growth	Incorrect / Incorrect Incorrect / Correct Sequence

I-II-07: Given a picture of a ruler, the student will determine the proper base line for measuring plant growth by selecting one picture out of four that shows the ruler in the proper position in relation to the pot for measuring plant growth.

Test Number and Symbol	Stimulus Slide	Topic being Tested	Response Slide
I-07-a Gloves	Ruler	What is proper way to measure plant growth?	Ruler on Plant / Ruler at base of plant Ruler at base of pot / Ruler on turned over pot

I-II-08: Given a picture of a potted plant, the student will demonstrate his ability to predict what will happen in a normal day's growth by selecting one picture out of four that correctly depicts a logical growth expectation in one day.

Test Number and Symbol	Stimulus Slide	Topic being Tested	Response Slide
I-08-a Octopus	Potted Plant	What is a logical growth expectation for one day?	Empty pot / Flower growing out bottom Full grown Tree / Plant showing some growth

I-II-09: Given a picture of a potted plant, the student will indicate his ability to devise a method of measuring and recording growth over a period of time by selecting one photograph out of four photographs of different measuring instruments that would be the most appropriate for measuring plant growth.

Test Number and Symbol	Stimulus Slide	Topic being Tested	Response Slide
I-09-a Pear	Potted Plant	Which instrument is best for measuring plant growth?	Stop Watch / Price Marker Tape Measure / Geiger Counter

I-II-10: Given a picture of a plant, the student will identify one possible reason for growth spurts on certain days by selecting one picture of a condition that helps plant growth from three other pictures of other conditions that do not aid plant growth.

?Test Number and Symbol	Stimulus Slide	Topic being Tested	Response Slide
I-10-a Tire	Plant	What condition helps plants grow	rain | snow dry soil | rock

Appendix 5

Sample Test Items

Kindergarten

Sample Test Items
Kindergarten
Unit IV - Using Our Senses

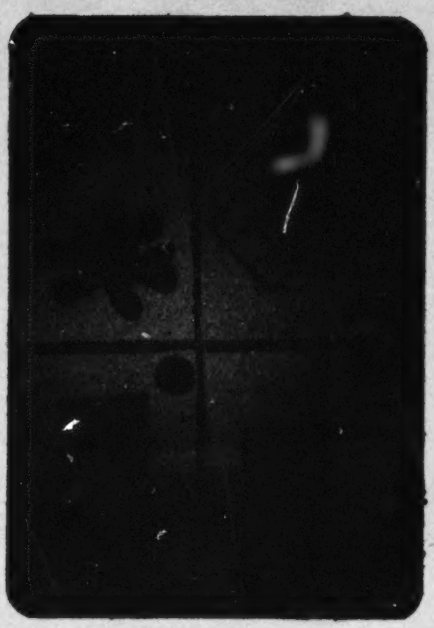
K-05-b: What makes a pleasant smell?

Stimulus Slide

Response Slide

K-07-c: Which object is also hot?

Stimulus Slide



Response Slide

Appendix 6

Sample Test Items

First Grade

Sample Test Items
First Grade

Unit II - Growing Seeds

I-07-a: What is the proper way to measure plant growth?

Stimulus Slide

Response Slide

Unit I - Changes

I-01-b-4: What is the next stage of growth for the tadpole?

Stimulus Slide

Response Slide

Appendix 7

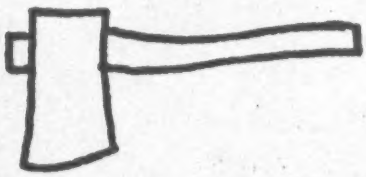
Answer Booklet

Kindergarten

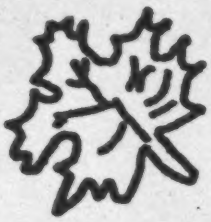
Appendix 8

Answer Sheets

First Grade



Student record sheet
Grade One
Name



Appendix 9

Additional Related Readings

References

1. Anderson, Ronald D. "Evaluation in Elementary School Science (Part I)." Science and Children, Volume 5, No. 1, September 1967, pp. 20-23

2. Anderson, Ronald D. "Evaluation in Elementary School Science (Part II)." Science and Children, Volume 5, No. 2, October 1967, pp. 33-36

3. Dunfee, Maxine, "Elementary School Science: A Guide to Current Research." Association for Supervision and Curriculum Development, National Education Association, Washington, D.C. 1967

4. Goehring, H. J., Jr. "Construction and Validation of a Film Slide Test to Measure Ability to Apply Scientific Method in a Selected Area of High School Physics." PhD Dissertation, University of Pittsburgh, 1956

5. Kearney, Brian J. "The Ability of High School Seniors to Identify and Apply Selected Principles of Physics," PhD Dissertation, The Pennsylvania State University, 1966.

6. Lindvall, C. M. Measuring Pupil Achievement and Aptitude, Harcourt, Brace & World, Inc., New York, 1967

7. Mager, Robert F., Preparing Instructional Objectives, Fearon Publishers, Palo Alto, California, 1962

8. Nelson, Clarence H., Improving Objective TEsts in Science. National Science Teachers Association, Washington, D.C. 1967

9. Palmer, R. R., Chairman. "Improving the Quality and Effectiveness of Introductory Physics Courses." Report of a Conference Sponsored by the American Association of Physics Teachers, Carleton College, September, 1955, "American Journal of Physics 25:417; 1957

10. Wise, Harold E. "A Determination of the Relative Importance of Principles of Physical Science for General Education." Ph D, The Pennsylvania State University, 1966.

Name _____ Unit ___